

Fast Simulation Vertex Study with $B^0 \rightarrow D^* K$

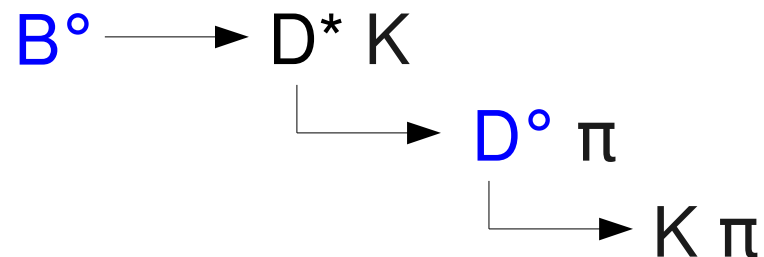
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Analyzed Data

Analysis Decay Chain



- Studied Vertex of B^0 , D^0

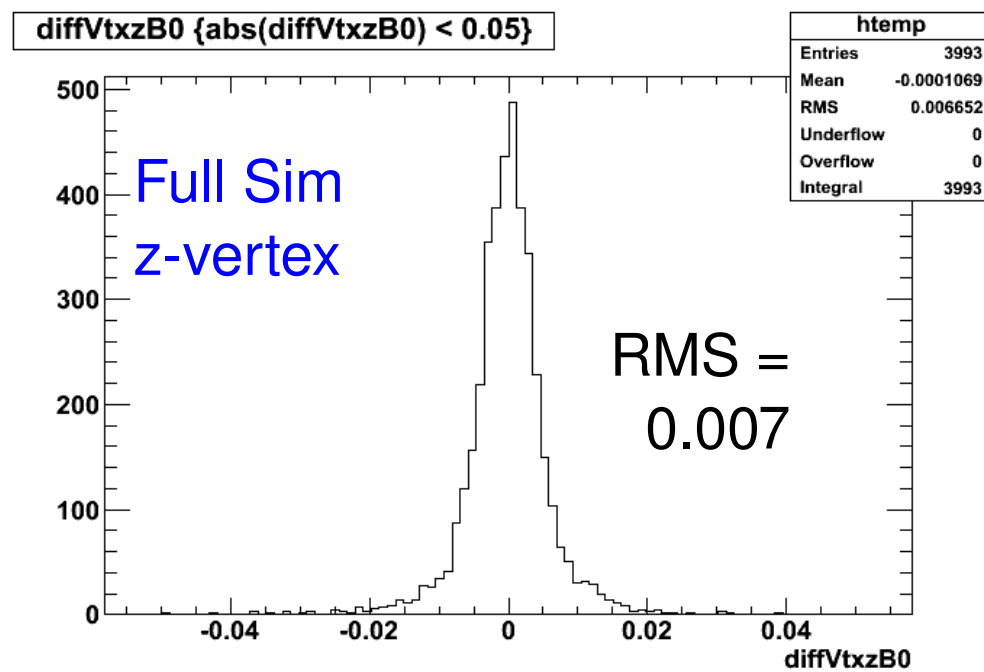
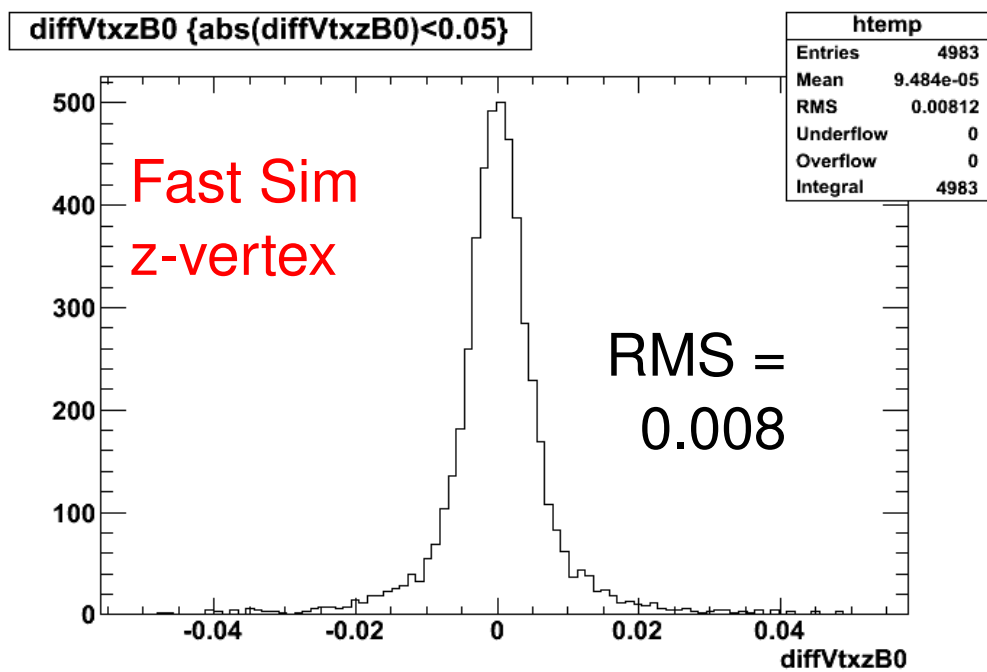
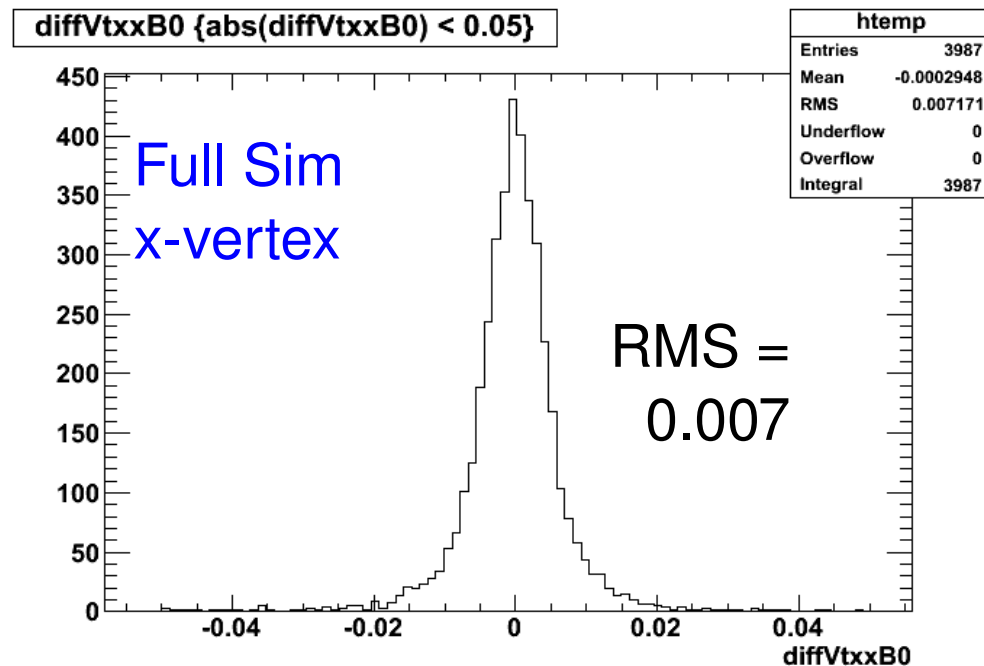
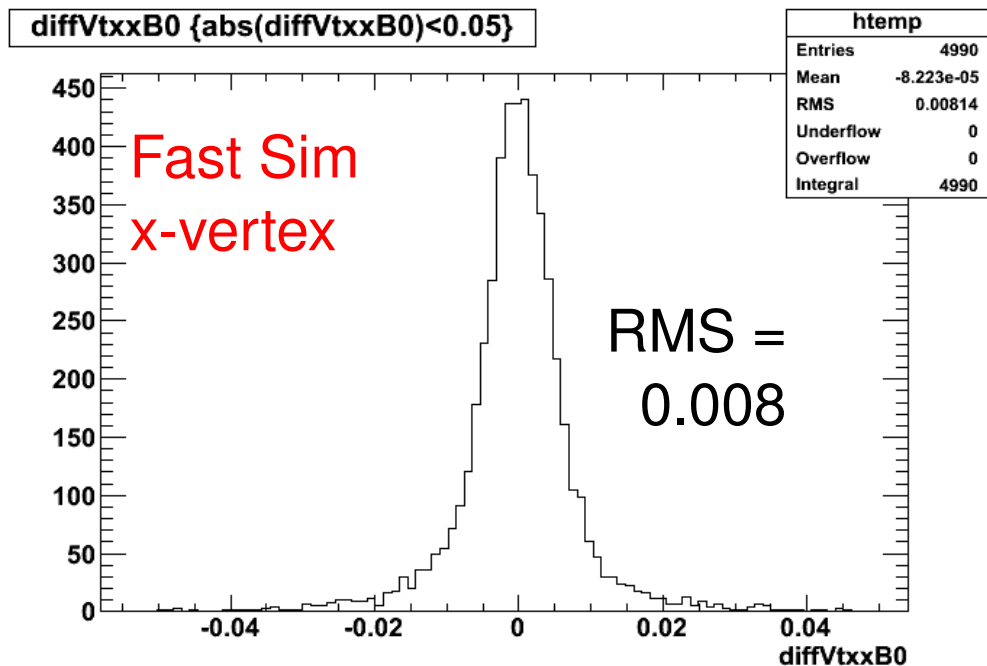
Event Selection

- Events without B^0 candidate is removed
- For events that have more than one B^0 candidate
 - Candidate with smallest $|\Delta E|$ was selected

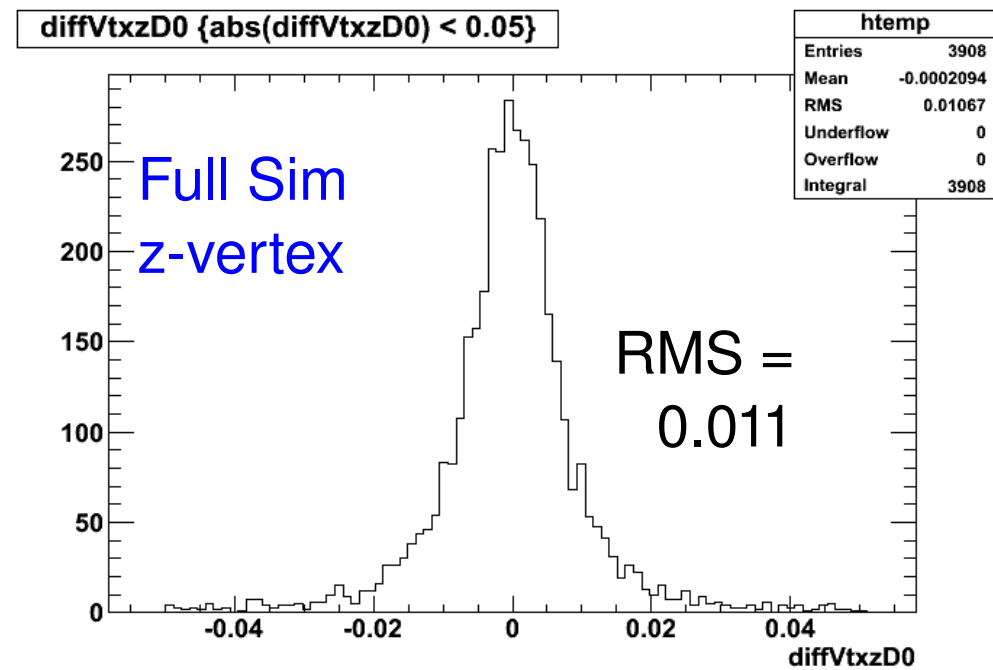
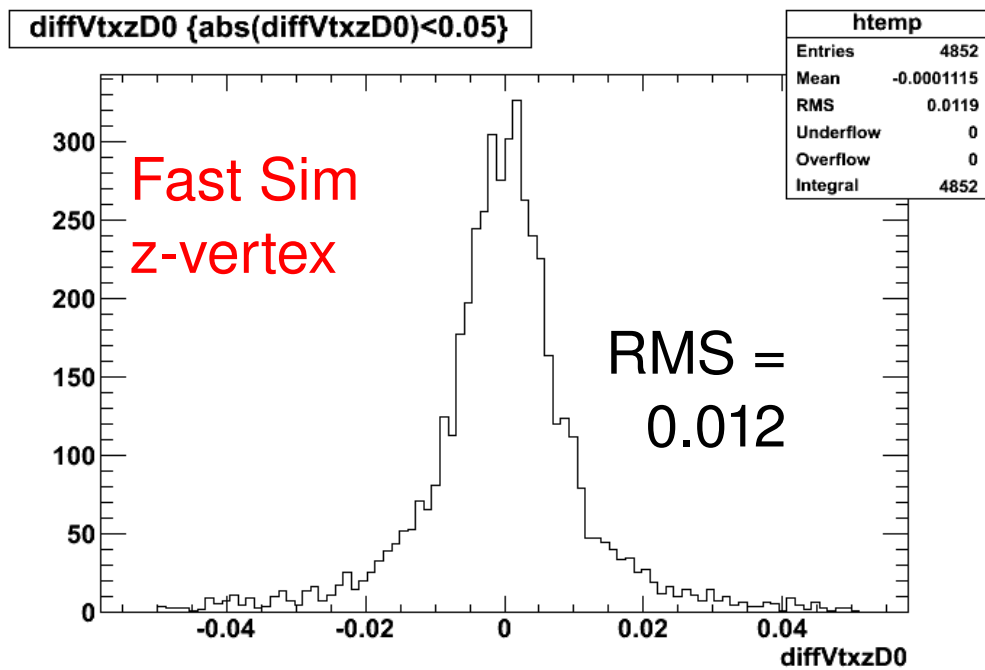
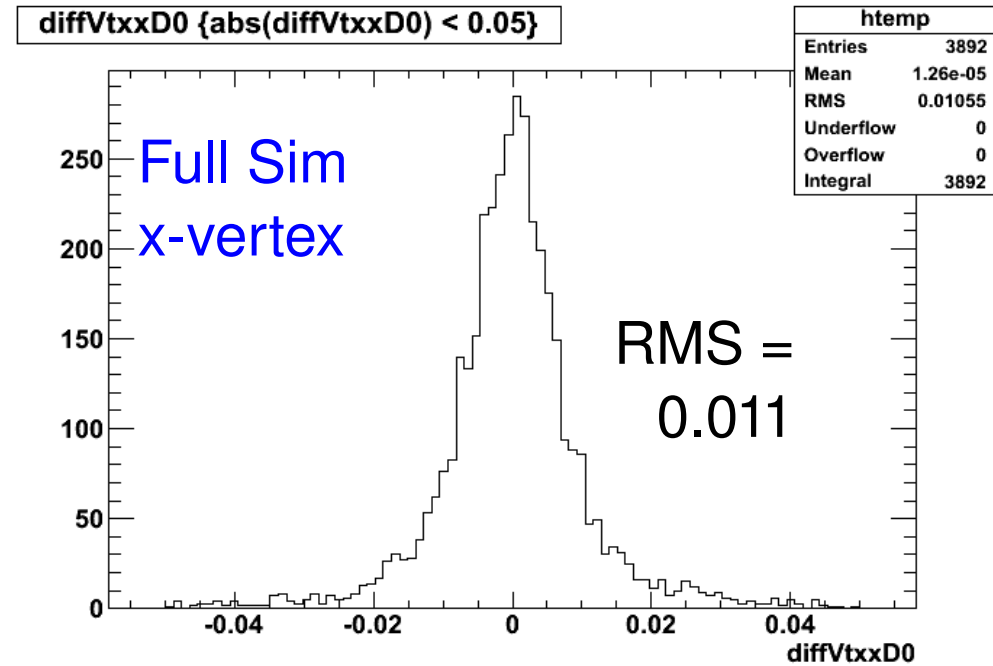
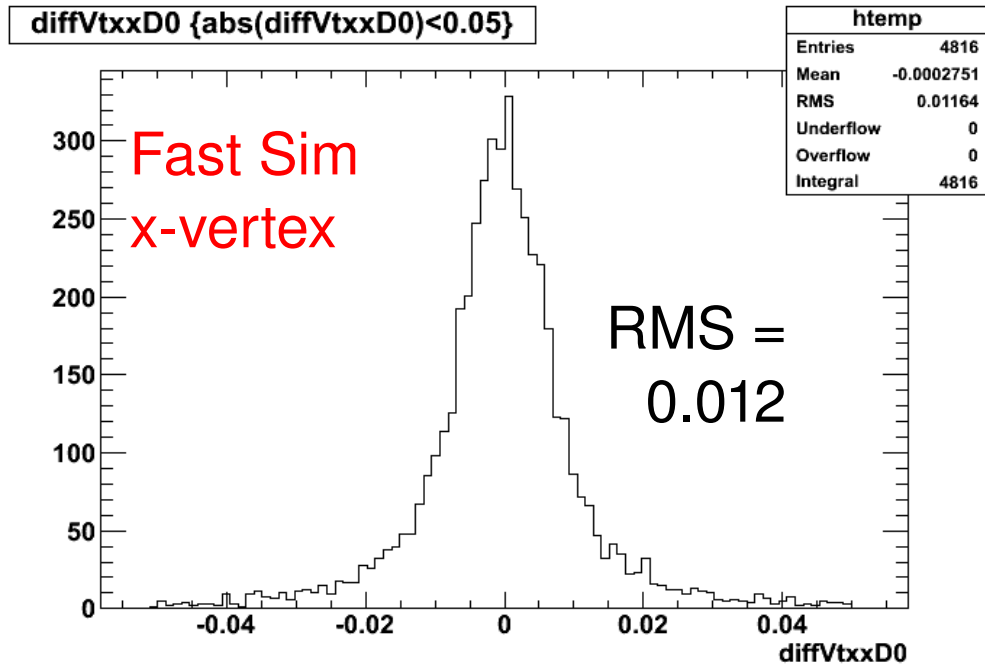
Vertex

- Vertex on signal side of decay was studied
- Simple Composition
- TreeFitter was used for fitting algorithm

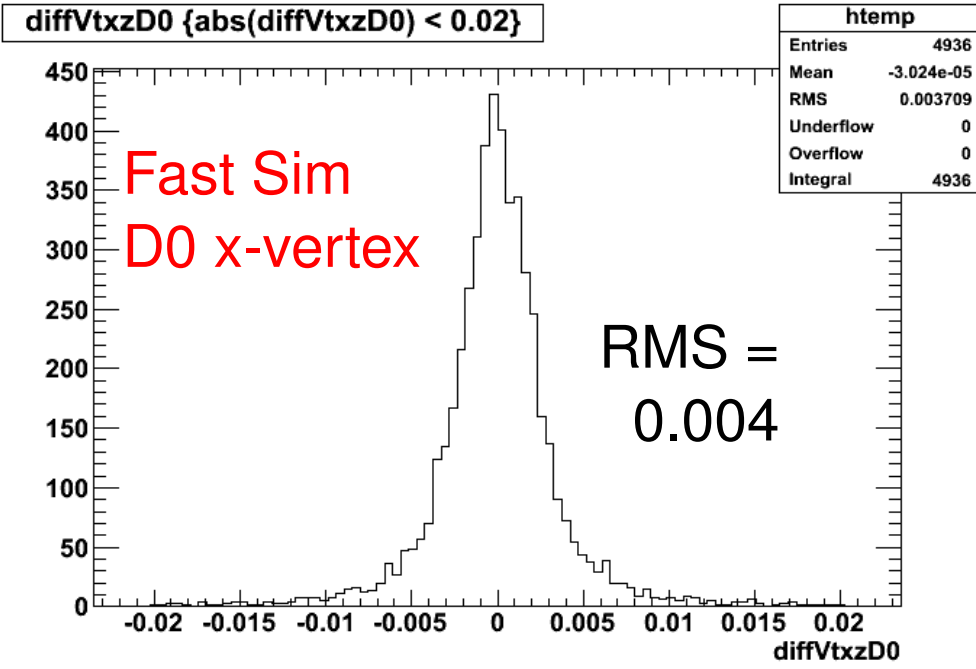
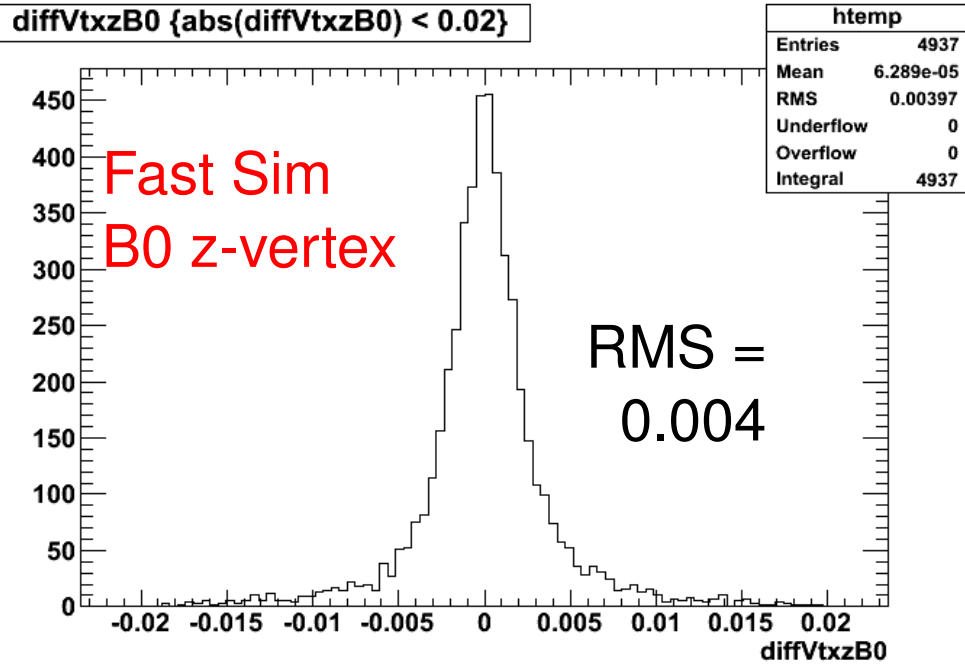
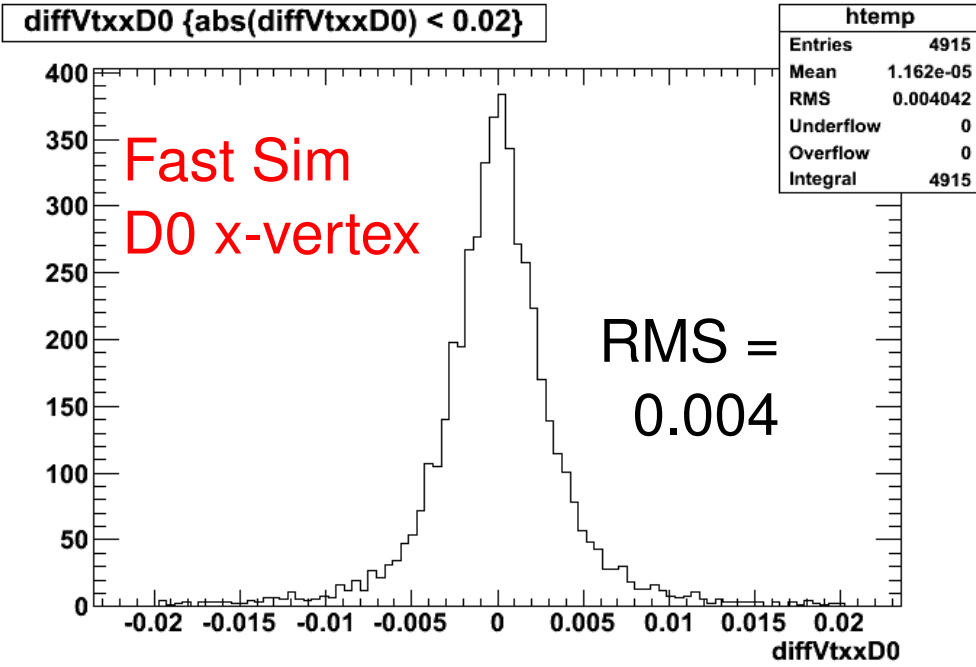
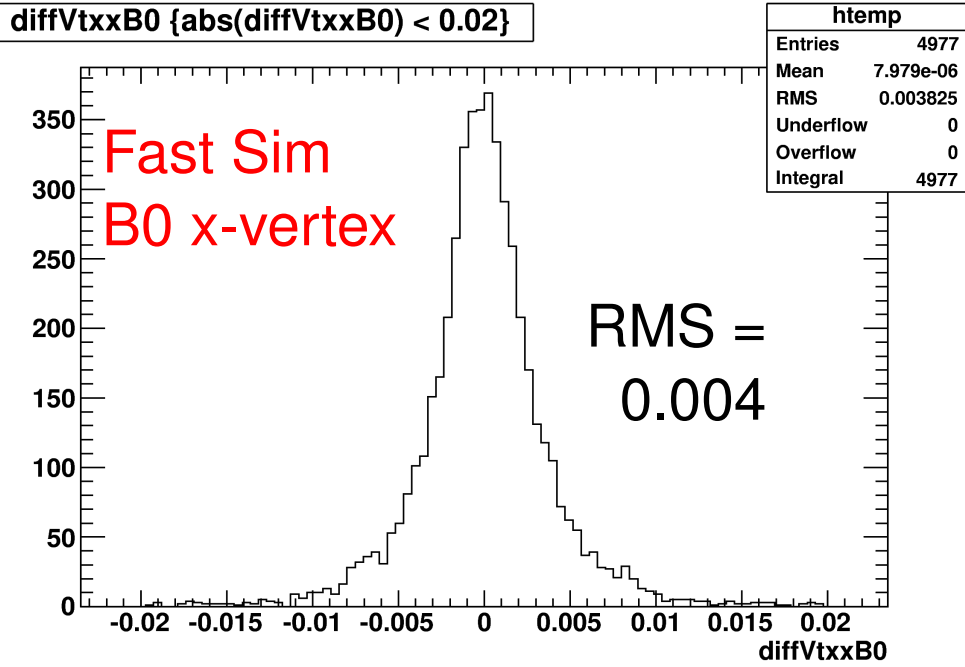
B⁰ Vertex with Babar Detector Configuration (SimpleComp - MC)



D⁰ Vertex with Babar Detector Configuration (SimpleComp - MC)



B⁰D⁰ Vertex with SuperB Detector Configuration (SimpleComp - MC)



Summary of Vertex Resolution with Babar / Super-B Configuration

- Reconstructed vertex resolution from **FastSim** shows agreement with **FullSim**.
 - Centers around 0
 - Resolutions agree between 10% ~ 20%
- Improvement on vertex resolution
 - B^0 0.008 → 0.004
 - D^0 0.012 → 0.004

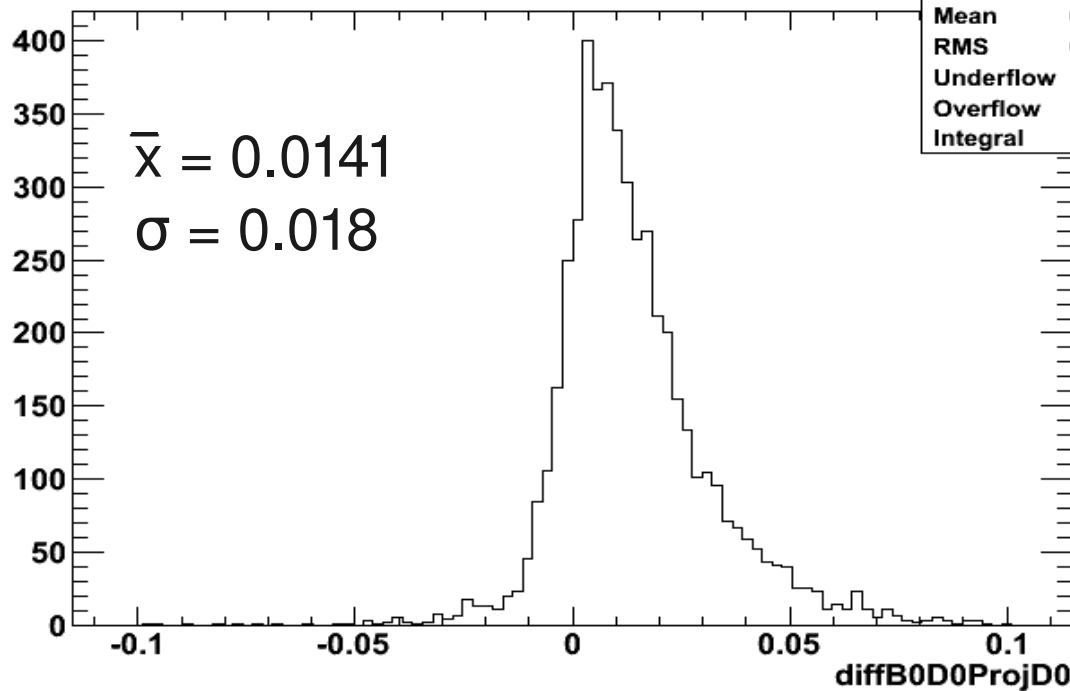
(D° - B°) Vertex Separation

- Study if its possible to distinguish B° and D° vertex
 - Plot vertex position difference in direction of momentum of D°

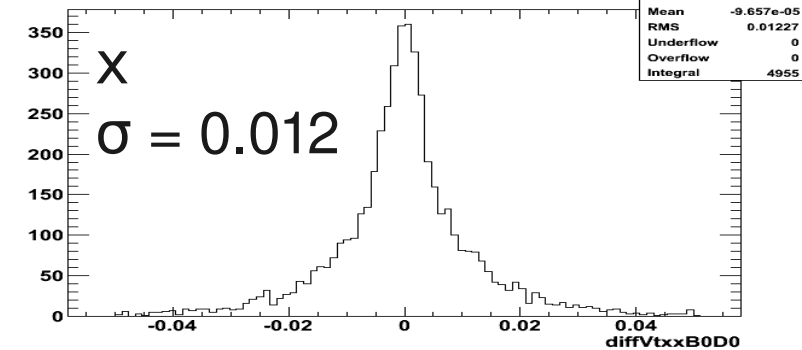
Vertex difference along D0 momentum

Vertex difference along x-y-z

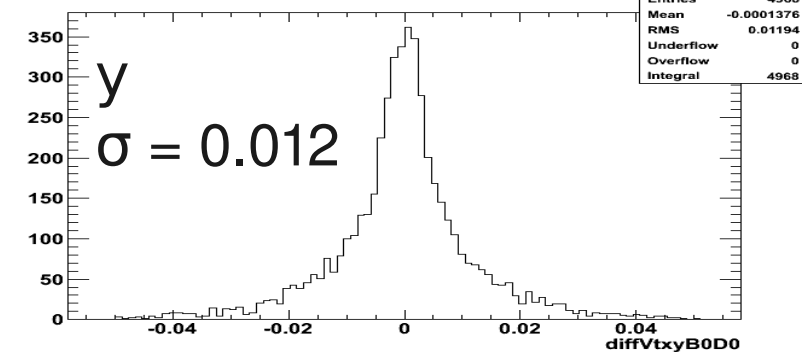
diffB0D0ProjD0 {abs(diffB0D0ProjD0) < 0.1}



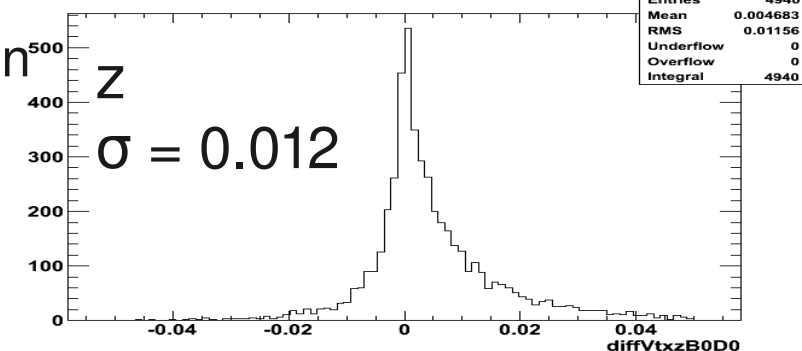
diffVtxxB0D0 {abs(diffVtxxB0D0) < 0.05}



diffVtxyB0D0 {abs(diffVtxyB0D0) < 0.05}



diffVtxzB0D0 {abs(diffVtxzB0D0) < 0.05}



- Separation along momentum is bigger than resolution
- Average 3.5σ away
- Vertices are separable

Conclusion

- Reconstructed vertex resolution from **FastSim** shows agreement with **FullSim**.
 - Resolutions agree between **10% ~ 20%**
- Improvement on vertex resolution
 - Factor of 2~3
- Vertex is separable on signal side
 - 3.5σ separation

Future Plan

- Look at generic decaying side for vertex separation
- Use more generic vertex algorithm for tagging side

Supporting Slides